# Justification for Collection and Potential Analysis of Individual Sturgeon Tissues: Relationship to assessment and measurement endpoints for maintenance of white sturgeon populations in the lower Willamette River.

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## Background

Meeting Notes - January 5, 2007 conference call -

The call convened among EPA and its government partners to discuss the LWG's revised draft sturgeon FSP. The Portland Harbor NPL Trustee Council requested (through Jeremy Buck and Chris Thompson) that blood, liver and muscle samples be secured from each of the 15 sturgeon collected during the planned sturgeon field sampling effort, rather than '5 additional fish' offered by LWG ( that the Trustees could preserve or analyze "as they see fit." )

Burt Shephard - (EPA Lead ERA) was amenable to collection of these additional samples, but asked for objective statements of the requests by the Trustees

> *"to be focused on how the information would be helpful in the ecological risk assessment and the remedial investigation to either quantify ecological risks, identify cleanup levels, or both."*

Burt also stated that as long as collection of such information did not compromise the integrity of the samples being collected for the RI or appreciably affect the field schedule, he would have no problem concurring with the Trustee's request that the LWG comply with the Trustee's request. Burt also said he would check with the RPMs on this issue. Subsequent to the sturgeon call, Burt talked with site RPM Eric Blischke about this issue. Eric also agreed in general with this.

The NOAA representative (Gouguet) also coordinated with the RPM, per the terms of the 1992 national NOAA/EPA CERCLA coordination MOA, regarding information on damage assessment endpoints and the injury potential suggested by such information, at least as a screening level. Eric agreed it best that the Trustees coordinate directly with the PRPs on sampling germane the Trustees 'maintaining their options'

## Objectives and Rationale

If white sturgeon collected from the Portland Harbor area contain elevated concentrations of organochlorine pesticides and polychlorinated biphenyls (PCBs), the Trustees wish to maintain the option to further reduce uncertainty in the resolution of this selected assessment endpoint. Further limited analyses may prove useful to put observed risk in proper regional context as we attempt to finalize this ERA. The Trustees recognize that the limited number of samples will only provide suggestive information. However, at the

least, these results will add to the body of knowledge being developed to manage potential contaminant effects to the sturgeon populations in the greater Columbia River Ecosystem.

## Sturgeon Measurement Endpoint - Lines of Evidence

These ME lines of evidence could be evaluated with the proposed samples (if the Trustees ultimately can find funding to analyze the samples - possibly unrelated to the Portland Harbor Site) for little additional sampling cost.

1. How do specific tissue contaminant residue values compare to those from sturgeon sampled from Columbia River impoundments (and outside the region) where suitable effects observations also exist?
2. How do contaminant concentrations and reproductive hormone levels in blood plasma compare to concentrations associated with reproductive effects in white sturgeon from Columbia River impoundments?
3. To quantify selected contaminant levels in red and white muscle and subcutaneous collected from a cross-sectional tissue sample from subadult white sturgeon with the intention of developing and evaluating the potential of 'plug sampling' as non-lethal monitoring tool of exposure in adults (potentially relevant to future remedial effectiveness monitoring)..

### *Tissues proposed for collection and intended analyses:*

- whole blood for analysis of organochlorine pesticides, polychlorinated biphenyls (PCBs)
- blood plasma for characterization of reproductive steroids
- a liver sub-sample to quantify organochlorine pesticides, PCBs, and metals
- a small, axial cross-section of tissue to analyze for organochlorine pesticides, PCBs, metals, and other constituents primarily by collecting muscle plugs from various locations of the tissue

## Relevance to Risk Assessment and Remedial Goals

Protection from excessive mortality, of 'normal' growth, or deleterious effects to reproduction due to site contaminants in the local white sturgeon population is a stated assessment endpoint for the Portland Harbor Site. One measurement endpoint thus far has been selected for this assessment endpoint:

- Comparison of 'whole body homogenate' tissue concentrations to relevant whole body to toxicity reference values (TRVs) for this or similar fish.

Because TRVs specific to white sturgeon are scarce and few studies report contaminants in 'whole body' in the literature, the risk assessors acknowledge that there will likely be a relatively high degree uncertainty surrounding risk results based only on one measurement endpoint alone.

The Trustees that samples be secured, as this opportunity permits, so they're available should the risk assessors need to ready way to reduce some degree of uncertainty and

provide additional, clarifying lines of evidence should they be needed during the sturgeon risk assessment or characterization.

Individual tissue contaminant concentrations often correlate well with concentrations in other tissues including whole-body tissues (Gunderson and Pearson 1992; Gunderson et al. 2004b). Analysis of specific COPECs /tissue pairs, related to anatomical 'sites of action' or depot locations (sites of sequestration), can provide additional, supporting measurement endpoint information. Comparison of quantified contaminants levels in these specific tissues (e.g., whole blood and liver) to similar results from 'other studies' conducted in the Columbia River (and elsewhere) where reproductive impacts to white sturgeon have been reported will clearly be useful in putting any incremental Portland Harbor site risk in proper context. Additionally, these samples could opportunistically add 'small science' to developing white sturgeon TRVs - albeit based here on concentration / effect 'associations.'

Finally, the Trustees propose taking a suitably located, cross-section of the fish tissue subsample with the intent of preliminary evaluation of biopsy as a tool for monitoring contaminant exposure to adult sturgeon based on relevant Columbia River (and elsewhere) comparative data. A cross-sectional sample will allow for subsampling (using muscle plug biopsy devices) of various fractions of tissue including red or white muscle and muscle with and without cutaneous and subcutaneous fat. A predictive relationship in subadult and adult sturgeon blood and muscle samples could be examined as an inexpensive, non-lethal monitoring tool for documenting reductions in contaminant concentrations and the effectiveness of remedial actions here and elsewhere in the Columbia and Willamette Rivers where sturgeon populations are threatened by the sum of the stresses to which they are presently exposed (COSEWIC 2003, Upper Columbia River White Sturgeon Recovery Initiative 2002). Once again this is a 'small science' effort that could be conducted for low incremental cost that may prove useful in the future.

## Summary

Because much of the existing research on white sturgeon has focused on analysis of individual tissues such as blood, liver, gonad, and filet tissues, the Trustees contend that information on individual tissues could yield results suitable and potentially valuable in completing both the risk assessment for this endpoint and to complete screening steps in our natural resource injuries assessment process. Research on various sturgeon species, including white sturgeon, has found significant relationships between contaminant levels in individual tissues and physiological effects (e.g., Gunderson and Pearson 1992; Gunderson et al. 1998, 2000, 2004a, b; Foster 2001a, b; Bowe et al. 2003; Webb et al. 2004, 2006; Feist et al. 2005). For example, these authors have shown that significant relationships occur between contaminants in blood, liver, and gonad tissue of white sturgeon, with higher concentrations relating to reproductive impacts as determined by histology of gonad tissue and blood steroid concentrations.

Ultimately, these data may be prove most useful in a 'meta-analysis' of data in aggregate for the system to improve nacent effects-based tissue TRVs for individual tissues in sturgeon. This information could in the end prove useful to complete this piece of the

Portland Harbor Risk assessment with acceptable uncertainty, it also should be useful for the trustees to better assess site related injury to white sturgeon.

As always, the Trustees are willing to share any data developed as part of this effort with the Government Partners and the LWG. Any cooperative efforts to fund some or all of the envisioned analyses will be appreciated, if these options need to be exercised.

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